

# Investigating Ad Transparency Mechanisms in Social Media: A Case Study of Facebook's Explanations

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MAX PLANCK INSTITUTE  
FOR SOFTWARE SYSTEMS

# Surrounded by data-driven decision making systems

- Recommender systems
- Criminal risk assessment tools
- Credit scores
- Targeted advertising

# We need more transparent systems

- Systems are often black boxes
- They use users' personal data at a massive scale
- They take decisions about users which can affect them

# We need more transparent systems

- Systems are often black boxes
- They use users' personal data at a massive scale
- They take decisions about users which can affect them
- Explanations on how such systems work are important
- Reflected in legislation:
  - GDPR
  - Loi pour une République numérique

# But explanations are not trivial

- The systems they have to explain are complex
- Many design choices:
  - format, length, amount of details...
- What is a good explanation?
  - promotes trust
  - satisfy curiosity
  - deter malicious behavior
  - verify compliance

# Our talk

Explanations for social media targeted advertising (focus on Facebook):

- targeted advertising in Facebook
- properties of explanations
- evaluation of Facebook's explanations

# Targeted advertising in Facebook



Sponsored Create Ad

Craig Zé

**RichesMonts** Sponsored · Like Page ...

Presque aussi fine qu'une crêpe et plus riche en pommes que le cidre : notre tarte fine aux pommes et à la raclette est idéale pour renouveler la chandeleur !

La recette : <http://bit.ly/TartePommesRaclette>

See Translation

**RainbowPick** Sponsored · Like Page ...

Lightweight Expandable Barrel

4L

RAINBOWPICK

Lightweight Expandable Barrel

\$16.99

Shop Now

Metabolic Body Massage Cup

\$9.99

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pusher.com  
Building awesome realtime apps with JavaScript

**TENEOTENEO** OPENING MINDS

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Visibility As A Service From Teneo

teneo.net

Increase Performance Insight and Speed Up Troubleshooting Without Committing to Extra Capi...

# Targeted advertising in Facebook



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Pusher - Leader  
pusher.com  
Building aweso...

**TENE**O  
VISIBILITY AS A SERVICE  
LEARN MORE

Visibility As A Service From Teneo  
[teneo.net](http://teneo.net)  
Increase Performance Insight and Speed Up Troubleshooting Without Committing to Extra Capi...

Why am I seeing this ad?

Barrel 4L

RAINBOWPICK

Lightweight Expandable Barrel \$16.99 [Shop Now](#)

Metabolic Body Massage Cup \$9.99

# How advertisers target users

Campaign

Objective

Ad Account

Create New

Ad Set

- Page
- Audience**
- Placements
- Budget & Schedule

Ad

- Identity
- Format
- Text

**Campaign**

**Locations** Everyone in this location ▾  
United States  
✓ United States  
Include ▾ Type to add more locations | Browse

**Add Locations in Bulk**

**Age** 18 - 65+

**Gender** All Men Women

**Languages** Enter a language...

**Detailed Targeting** INCLUDE people who match at least ONE of the following ⓘ

Transparency	Suggestions	Browse
Transparency (behavior)	Interests	
Media transparency	Interests	
Transparency and translucency	Interests	
Extractive Industries Transparency Initiative	Interests	
Lobbying in the United States	Interests	
Transparent	Interests	

**Create Multiple Ad Sets in One Step**

Add variables for locations, detailed targeting, age ranges and Custom Audiences to quickly create multiple ad sets at one time.

**Create Multiple Ad Sets**

**Audience Size**

Your audience selection is fairly broad.

Specific Broad

Potential Reach: 230,000,000 people ⓘ

**Estimated Daily Results**

**Reach**  
5,100 - 32,000 ⓘ

The accuracy of estimates is based on factors like past campaign data, the budget you entered and market data. Numbers are provided to give you an idea of performance for your budget, but are only estimates and

# Many attributes available for targeting



# Many attributes available for targeting

Interests	
▶	Business and industry <input type="checkbox"/>
▶	Entertainment <input type="checkbox"/>
▶	Family and relationships <input type="checkbox"/>
▶	Fitness and wellness <input type="checkbox"/>
▼	Food and drink <input type="checkbox"/>
▼	Alcoholic beverages <input type="checkbox"/>
	Beer <input type="checkbox"/>

Demographics	
▶	Education <input type="checkbox"/>
▶	Financial <input type="checkbox"/>
▶	Home <input type="checkbox"/>
▼	Life Events <input type="checkbox"/>
▶	Anniversary <input type="checkbox"/>
	Away from family <input type="checkbox"/>
	Away from hometown <input type="checkbox"/>

# Many attributes available for targeting

Detailed Targeting i INCLUDE people who match at least ONE of the following i

Interests

Business and industry

Entertainment

Family and relationships

Fitness and wellness

Food and drink

Alcoholic beverages

Beer

Demographics > Life Events > Anniversary

**Anniversary within 30 days**

Interests > Food and drink > Alcoholic beverages

**Beer**

Add demographics, interests or behaviors | **Suggestions** | **Browse**

and MUST ALSO match at least ONE of the following i X

Demographics > Life Events

**Away from family**

Add demographics, interests or behaviors | **Suggestions** | **Browse**

Narrow Further

EXCLUDE people who match at least ONE of the following i X

Interests > Additional Interests

**Gumbo**

Add demographics, interests or behaviors | **Browse**

# Many attributes available for targeting



People in the market for a  
sports car, owners of luxury  
SUVs

What are the types of Partner Categories?



Heavy cleaning supplies  
buyers, heavy hair care buyers



Credit card holders, likely  
investors



Discretionary spenders,  
seasonal spenders, brand  
buyers

# Attributes can be invasive

INCLUDE people who match at least ONE of the following [i](#)

Homosexuality	Suggestions   <a href="#">Browse</a>
<b>Homosexuality</b>	Interests
Same-sex marriage	Interests

# Attributes can be invasive

INCLUDE people who match at least ONE of the following ⓘ

Homosexuality	Suggestions   <b>Browse</b>
<b>Homosexuality</b>	Interests
Same-sex marriage	Interests

INCLUDE people who match at least ONE of the following ⓘ

Fascism	Suggestions   <b>Browse</b>
<b>Fascism</b>	Interests
Anti-fascism	Interests

# Attributes can be invasive

INCLUDE people who match at least ONE of the following ⓘ

Homosexuality	Suggestions   <b>Browse</b>
<b>Homosexuality</b>	Interests
Same-sex marriage	Interests

INCLUDE people who match at least ONE of the following ⓘ

Fascism	Suggestions   <b>Browse</b>
<b>Fascism</b>	Interests
Anti-fascism	Interests

INCLUDE people who match at least ONE of the following ⓘ

Income >	Suggestions   <b>Browse</b>
<b>Income &gt; 2. \$50,000 - \$74,999</b>	Demographics
<b>Income &gt; 3. \$75,000 - \$99,999</b>	Demographics
<b>Income &gt; 6. \$150,000 - \$249,999</b>	Demographics
<b>Income &gt; 4. \$100,000 - \$124,999</b>	Demographics
<b>Income &gt; 5. \$125,000 - \$149,999</b>	Demographics
<b>Income &gt; 1. \$40,000 - \$49,999</b>	Demographics

# Data on everyone

Out of 230M users (US):

- Politics (US): 179M
- Financial/Net worth/Liquid Assets: 74M
- Family & Relationships: 138M

# Targeting advertising is a complex system

# Targeting advertising is a complex system

Why did I receive this ad?

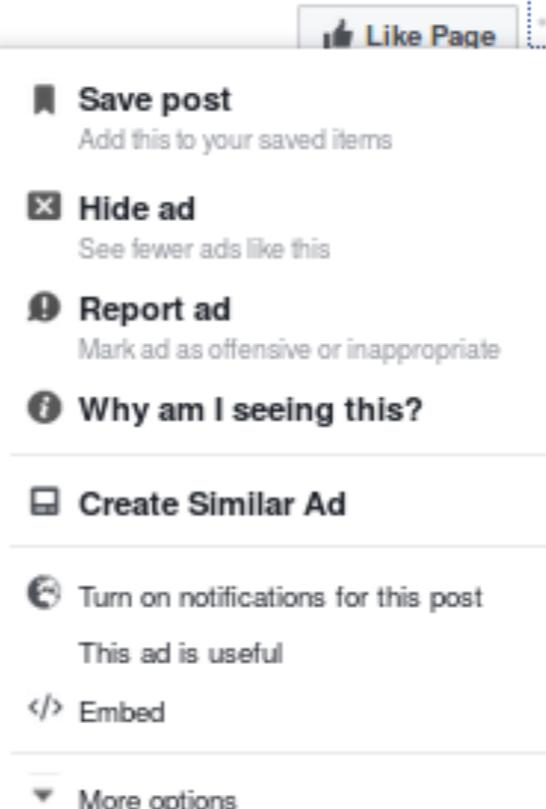
- Facebook inferred some attributes
- Advertiser used attributes to select audience
- Facebook matched the ad to me through auctions

# Facebook provides ad explanations

 **Leibniz**  
Sponsored · 

Weckt Frühlingsgefühle schon im Winter  
Cheesecake Style mit weißer Schokolade

[See Translation](#)



**LEIBNIZ**  
KEKS MIT WEISSEMER  
SCHOKOLADE  
& ZITRONEN-KÄsekuchen-Geschmack



**LEMON**  
CHEESECAKE  
STYLE KNACKFREISCHGARANTIE



frischer Lemon-Cheesecake-Geschmack

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frischer Lemon-Cheesecake-Geschmack

Like Page ...

- Save post  
Add this to your saved items
- Hide ad  
See fewer ads like this
- Report ad  
Mark this content as inappropriate
- Why am I seeing this?
- Create Similar Ad
- Turn on notifications for this post  
This ad is useful
- Embed
- More options

# Facebook provides ad explanations

Leibniz

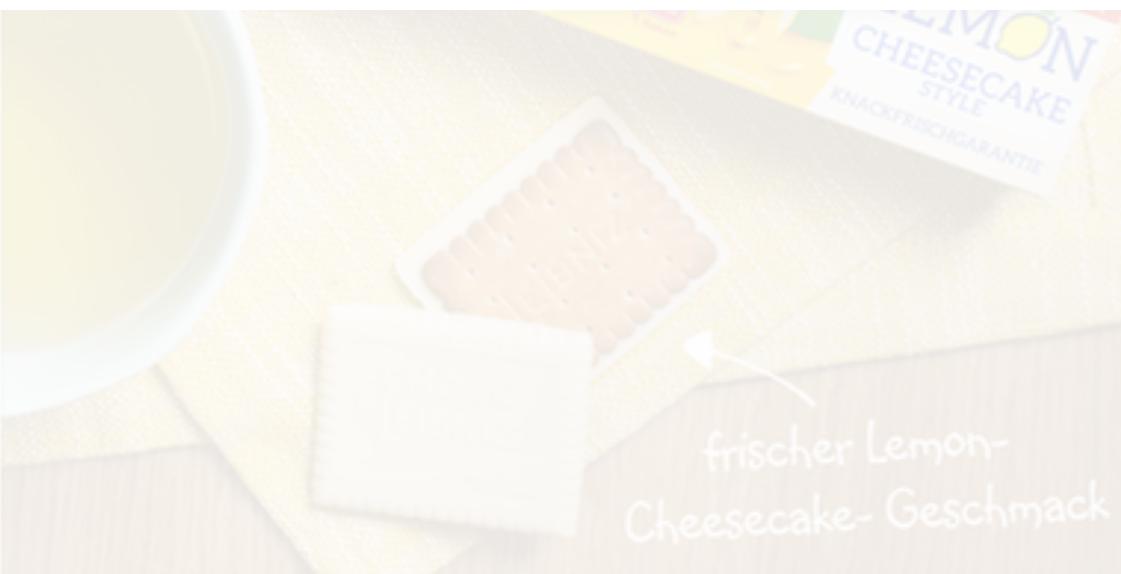
Like Page

Options ▾

## Why Am I Seeing This Ad?

One reason you're seeing this ad is that Leibniz wants to reach people interested in Ferrero SpA, based on activity such as liking Pages or clicking on ads.

There may be other reasons you're seeing this ad, including that Leibniz wants to reach people ages 25 and older who live or were recently in Germany. This is information based on your Facebook profile and where you've connected to the internet.



# Facebook provides ad explanations

Leibniz

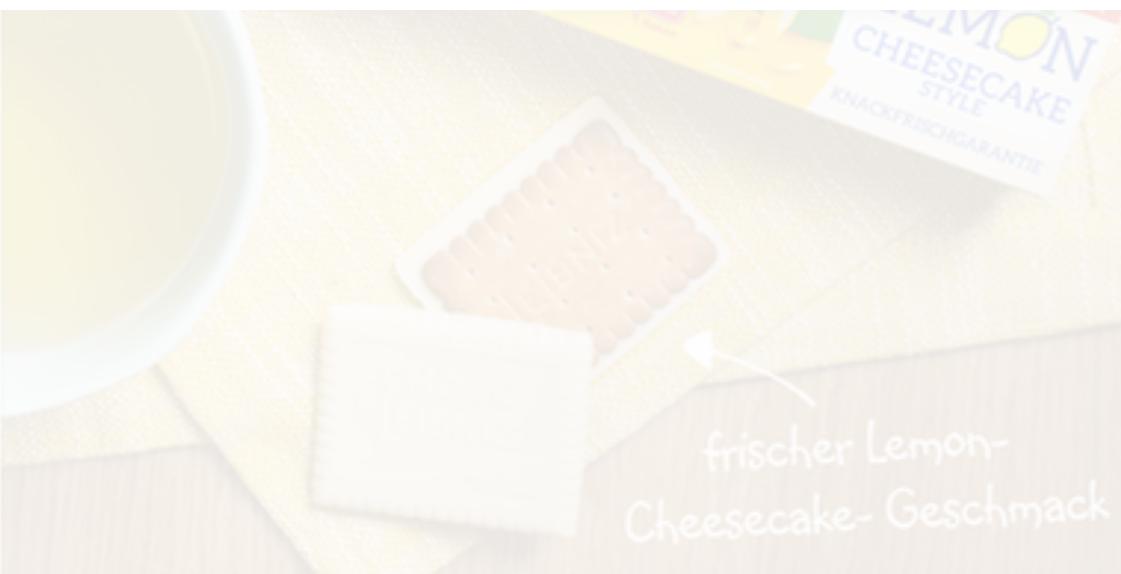
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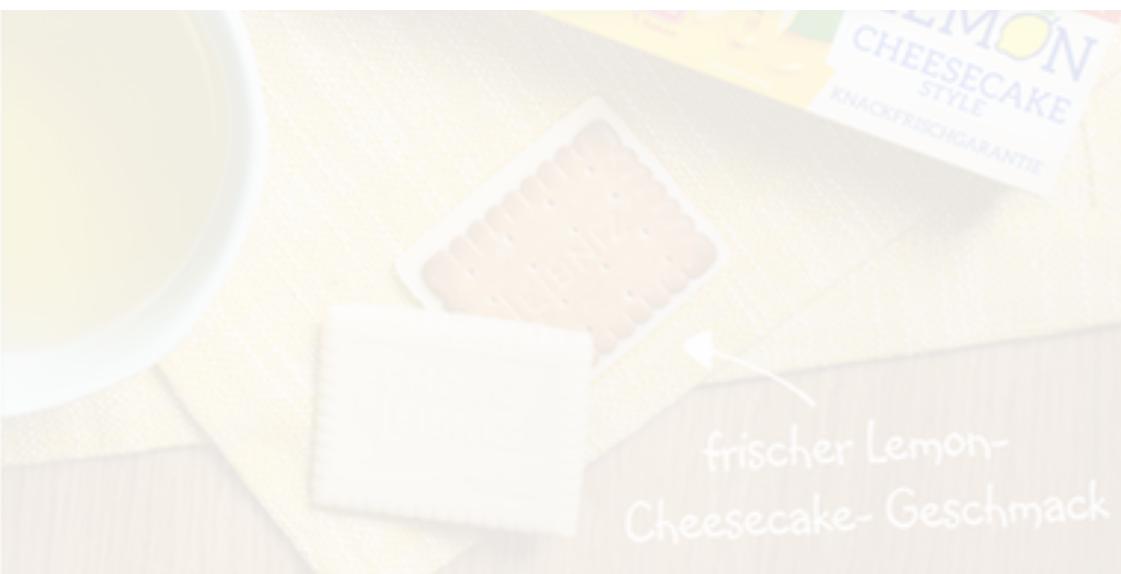
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# Our talk

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- **properties of explanations**
- evaluation of Facebook's explanations

# Desired properties of explanations

- Do explanations show all the attributes?  
**completeness**
- Are they correct?  
**correctness**
- Are they personalized?  
**personalization**
- Do similar ads show the same explanations?  
**determinism**
- Are explanations for users consistent  
**consistency**

# Completeness of explanations

## User



### Interests:

- Koalas
- Kangaroos
- Wallabies
- ...

## Ad

*Target users interested in  
Koalas AND Kangaroos*

- **Complete explanation:**
  - *You received this ad because the advertiser wants to target users interested in Koalas And Kangaroos*
- **Anything less is incomplete:**
  - incomplete explanations are not inherently bad.
  - they can be succinct, useful and ultimately preferable for such explanations

# Correctness of explanations

## User



### Interests:

- Koalas
- Kangaroos
- Wallabies
- ...

## Ad

*Target users interested in  
Koalas AND Kangaroos*

- **Incorrect explanation:**

- *You received this ad because the advertiser wants to target users interested in Wallabies*

- **Misleading explanation:**

- *You may have received this ad because the advertiser wants to target users interested in Wallabies*

# Our talk

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# Measurement methodology

- Chrome extension to collect ads from Facebook timeline:
  - 35 users for 5 months
  - 26K unique ads and explanations

# Measurement methodology

- Chrome extension to collect ads from Facebook timeline:
  - 35 users for 5 months
  - 26K unique ads and explanations
- Controlled experiments targeting users with ads:
  - We targeted users
  - We collected explanations
  - 96 successful experiments



Ground truth

# Examples of explanations

- Interests:
  - *One reason you are seeing this ad is that Acer wants to reach people interested in Electronic Music, based on activity such as linking pages, or clicking on ads*

# Examples of explanations

- Interests:
  - *One reason you are seeing this ad is that Acer wants to reach people interested in Electronic Music, based on activity such as linking pages, or clicking on ads*
- Data Brokers:
  - *One reason you're seeing this ad is that CANAL France wants to reach people who are part of an audience created based on data provided by Acxiom. Facebook works with data providers to help businesses find the right audiences for their ads. Learn more about data providers.*

# Are explanations complete?

- We see only one attribute
- Controlled experiments to verify:
  - e.g. target users interested in Instant messaging AND Mobile Phones
  - "...wants to reach people interested in Instant messaging..."
- Which attribute appears?
  - Depends on attribute type (e.g. Demographics>Interests>Behaviors)
  - Depends on reach (least unique attribute appears)

# Are explanations complete?

- Data Brokers attributes:
  - *part of an audience created based on data provided by Acxiom.*
- No mention of the attribute used:
  - Income data, home ownership, home type?

# Are explanations complete?

- Data Brokers attributes:
  - *part of an audience created based on data provided by Acxiom.*

- No men

- Income < 100k

Facebook explanations are not complete!

# Are explanations correct?

## Why Am I Seeing This Ad?

Options ▾

One reason you're seeing this ad is that **fifty-five** wants to reach people interested in **Online advertising**, based on activity such as liking Pages or clicking on ads.

There may be other reasons you're seeing this ad, including that fifty-five wants to reach **people ages 23 to 55 who live or were recently in France**. This is information based on your Facebook profile and where you've connected to the internet.

- Controlled experiments to test correctness:
  - We targeted users without specifying location
  - Location always appeared as potential attribute

# Are explanations correct?

## Why Am I Seeing This Ad?

Options ▾

One reason you're seeing this ad is that **fifty-five** wants to reach people interested in **Online advertising**, based on activity such as liking Pages or clicking on ads.

There may be other reasons you're seeing this ad, including that fifty-five wants to reach **people ages 23 to 55 who live or were recently in France**. This is information based on your Facebook profile and where you've connected to the internet.

Facebook explanations can be misleading!

- Controlled by algorithm
  - We targeted users without specifying location
  - Location always appeared as potential attribute

# Need for rigorous explanations

- Incomplete explanations:
  - malicious advertiser can conceal sensitive/discriminatory attributes
  - by adding a common popular attribute to the targeting audience
- Misleading explanations:
  - fail to capture accurately the reasons why a user is targeted
- Establishing properties can help create better explanations

# Conclusions & open questions

- We defined desired properties for explanations
- Current Facebook explanations are **incomplete & misleading**
- How to design better explanations?
  - How to choose the most important attributes to show?
  - What do users want to see in an explanation?

# A step towards more transparency

- AdAnalyst: A tool to help you make sense of the ads you receive on Facebook
  - <http://adanalyst.mpi-sws.org/>
  - Enhance transparency by aggregated statistics
  - Enhance transparency in a collaborative way

**Disable your AdBlocker on Facebook**

Thank you very much

Questions?